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Levetiracetam and Memory Loss

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ABSTRACT

Epilepsy is defined as a chronic disorder that causes a sudden rush of electrical activities in the brain. These seizures may be partial or general. While fractional annexations affect a solitary part of the brain, comprehensive seizures distress the entire brain and its activities. There exist myriad options for seizure treatment. Use of Keppra, the brand name for Levetiracetam, is one of the most adopted forms of treatment. These seizures are generally caused by low blood sugar, alcohol withdrawal as well as head trauma. For one to be prescribed seizure drugs, signs such as simple partial seizures, complex partial seizures as well as general seizures must be present. There are other options for managing seizures such as brain surgery, adopting a Ketogenic diet and anti-epileptic drugs. Levetiracetam is typically prescribed as an add-on to these seizure drugs to boost their effectiveness and as well ensure improved quality of life. While essential resources and information are recommending the use of Levetiracetam, there are also sources discrediting the drug with evidence of causing memory loss and reduced quality of life. Therefore, this study aims at collecting information from different scholarly articles, journals, and websites about the side effects of using Levetiracetam in different populations. After the data is explored, the study offers a comprehensive conclusion based on the information available. The study, therefore, affirms that the use of Levetiracetam improves the quality of life and it does not affect or interfere with the cognitive functions of the brain. The study seeks to demystify the linking of Levetiracetam to memory loss of its users.



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INTRODUCTION

Keppra, the brand name for Levetiracetam, is usually prescribed together with anti-seizure drugs to mostly treat children who experience seizures (Keppra, 2019). The drug effectively works to moderate the transmission of neuro-electric signals in the brain. In accomplishing this, the drug

contains different chemicals that alter the functioning of the nerves in the brain, especially those responsible for the transmission of signals. Short-term use of the drug is associated with effects such as fatigue, sleepiness, drowsiness, feelings of aggression, and people reportedly become more easily irritated. On a long-term, depression, mood swings and decreased appetite may be noted. Also, users report increased allergy to different conditions. On the other hand, Kumar and Kadian (2018) argue that Levetiracetam is a drug used to treat partial seizures, myoclonic annexations, and tonic-clonic annexations. In a myoclonic seizure, this antiepileptic drug can be used in the diagnosis of myoclonic appropriations in grownups and children myoclonic epilepsy in teenagers 12 years and older. From an extensive range of available data, scholars have arguably offered their stands on the use of this drug. The association of this drug with memory loss is still a debatable issue that raises

different concerns. However, as this paper aims to portray, Levetiracetam has more to it than just the mere short-term side effects. Also, the paper intends to shed light on the true nature of this drug as it has no association to memory loss as different scholars portray in their articles and books.

Literature review

Up to modern times, several plethoras of literature has been documented describing the effect of the Levetiracetam when it comes to cognitive performance and memory loss. In reviewing the literature by Magalhães, Gongora, Vicente, Bittencourt, Tanaka, Velasques, Teixeira, Morato, Basile, Arias-Carrión, Pompeu, Cagy, & Ribeiro (2015), the authors focus on examining the influence of Levetiracetam (LEV) when it comes to the cognitive performance. Indeed, the process of increasing cognitive performance has been among the frontiers knowledge as scientists are trying the possibility of expanding our capacity of attention, alertness, decision-making, and cognitive flexibility. Such move, as created various drugs that act as cognitive enhancers, which can support individuals suffering from diseases like dementia, attention deficit disorder, and other multiple psychiatric diseases (Megalhae, Julio Cesar *et al.*, 2015). Additionally, the long-term goal of neuroscience is to realize the possibility of expanding the human capacity to make decisions, alertness, and integration of information as well as cognitive flexibility.

Consequently, due to the nature of diseases such as dementia and attention deficit disorder, the need for drugs to increase cognitive functions has been on the rise. These drugs are envisioned to increase the efficiency of the brain by improving specific cognitive functions (Megalhae, Julio Cesar, *et al.*, 2015). Some of the drugs that have come close to this include psycho-stimulants, modafinil as well as amphetamines. For this research, Megalhae, Julio Cesar *et al.* (2015) and the other researchers employ the use of Levetiracetam to determine its ability to improve the cognitive functions. The effects of the drug on the brain is measured by electroencephalography that effectively detects any electrophysiological changes. From this research, it is evident that perhaps promotes cognitive enhancement in brain activities. Therefore, the analysis differs from the hypothesis that Levetiracetam causes memory loss (Megalhae, Julio Cesar, *et al.*, 2015). Also, Levetiracetam is discovered to progress the eminence of life of patients with onset seizures who have prescribed Levetiracetam as add-ons to the therapy medication. However, this study offers no evidence concerning the long-term impacts of the drug on the quality of life of the test-group.

On the other hand, from the electrophysiological parameters to the frontopolar cortex, prefrontal interior gyrus, and anterior frontal cortex, the finding from the study by Megalhae, Julio Cesar *et al.* (2015) indicate that Levetiracetam is associated with an increase in the cognitive performance in the executive roles. The positive effect of LEV is entirely instrumental, and little pieces of literature suggest a negative effect when it comes to the treatment of epilepsy. Just as provided by Wheless (2007), epilepsy is a shared sickness that is recurrent in children and as momentous challenges when it comes to treatment. This is because the disease is associated with seizures as the disease causes mental retardation and other significant behavioral problems. However, antiepileptic drugs have been developed including Levetiracetam, which has a comprehensive range with the unusual preclinical and pharmacological outline. This has been demonstrated in the rodent studies; it showed no activity in conventional severe seizure replicas but showed potent appropriation protection in chronic epilepsy models (Wheless, 2007).

Moreover, it is also evident that Levetiracetam also has protective factors in contradiction of annexations in rodent replicas of chemoconvulsant-induced incomplete annexations (Wheless, 2007). Levetiracetam showed anti-epileptogenic properties over its capability to constrain the expansion of tinder in mice and rats and established a tall safety boundary likened with additional AEDs in hereditary replicas and sparked animals. The above giving from the rodent experiment, clearly shows that Levetiracetam has not damagingly influence or trigger memory loss. Besides, the study affirms that Levetiracetam does not negatively impact cognitive functions both in grownups and children and tend to have better memory profile compared to other antiepileptic drugs. Mbizvo, Dixon, Hutton, and Marson (2018) argue that Levetiracetam can meaningfully decrease focal seizure incidence when it is used as an add-on action for both grownups and kids with drug-resistant principal epilepsy.

Zhou, Zang, Tian, Xiao, Stefan, and Zhou (2008) offers abundant information on the properties of Levetiracetam when administered as an add-on therapy on the excellence of life especially on patients with headstrong partial seizures. The research involves the administration of the drug in two phases with a baseline of eight weeks. Including other complicated systems, the changes in cognitive functions were recorded using the Trail Making Test. At the end of the research, Levetiracetam reflected adverse effect in memory loss and in a way improves the cognitive functions (Zhou, Bo *et al.*, 2008). Similarly, according to Piazzini, Chifari, &

Canevini MP, et al. (2006) (cited in Wheless, 2007), Levetiracetam tends to have a potential impact on the cognitive effects in most of the cognitive function. Supporting their argument from multiple pre-clinical studies in the animal models, Piazzini, Chifari, & Canevini MP, et al. (2006) posit that Levetiracetam does not have an adverse effect on the reminiscence purpose in normal or amygdala-kindled rats in the Morris aquatic maze test. Moreover, the study also realized no effect on attention on rats; instead, there were optimistic effects on the cognitive function.

Conversely, to test the effects of the Levetiracetam on healthy rats, Dhande, Gonarkar, Sanghavi, & Pandit (2015) performs research of the use of a combination of Levetiracetam and Topiramate on cognitive ability on animals. While most of the anti-seizure drugs are reported to cause bipolar disorder, anxiety, and neuropathic pain, Levetiracetam offers a different range of data. The research included testing the longitudinal learning and reminiscence of rats with changes in leakage transmission dormancy being chronicled for all rats (Dhande *et al.*, 2015). At the end of twenty-one days, the spatial memory in rats is impaired by Topiramate and Levetiracetam cannot fix this impairment. Therefore, in as much as Levetiracetam report improvement in cognitive functions, it can hardly correct memory loss nor cause it as it is only Topiramate that causes impairment. Separately, when it comes to the evaluation of the effectiveness and wellbeing of levetiracetam (LEV) in the pediatric epilepsy, Elberry, Felemban, Hareeri, & Kurdi (2011) in their study reveals that Levetiracetam is an effective antiepileptic medication as a therapy diagnosis for children with epilepsy, particularly those that are characterized by tonic-clonic seizure. By conducting a chart review among 22 children with Levetiracetam followed by historical observation, the study was carried out on children identified with epilepsy founded on clinical assessment and electroencephalogram (EEG) abnormalities.

Furthermore, the broods with associated circumstances as developing delay, brain malformations, an inborn error of breakdown were excluded from the study. Their findings suggested that the frequency of epilepsy was reduced by 41 percent among the pediatric patient diagnosed by Levetiracetam (Elberry, Felemban, Hareeri, & Kurdi, 2011). Besides, the findings were consistent among the children with developing delay, brain malformations, an inborn error of breakdown, as Levetiracetam was discovered to effective in reducing the epileptiform EEG abnormalities. Levetiracetam result in improved cognitive functions, behavior, safety, tolerability, and efficacy especially in children aged between four to fourteen

years of age as recorded by Yi, Wen, Cai, Xu, Zhong, Zhan, and Zhai (2018). Cognition and behavior in children are effectively measured using the Leiter-R International Performance Scale for a period of forty-eight non-comparable weeks. The research indicates toleration of the drug with minor side effects such as headache, aggression, and irritability. Despite a small portion of the sample leaving the investigation due to the adverse impacts of the drug, Levetiracetam offers good seizure control with a quarter of the sample size reporting complete freedom from all seizures (Yi *et al.*, 2018). Besides, Levetiracetam is associated with improved cognitive functioning as well as improved emotional behavior of children. The research nullifies the hypothesis that Levetiracetam are (or can be) associated with memory loss in children or adults. Moreover, the study discovers that Levetiracetam is related to an increase in cognitive functions and has an advantage for pregnant women (Yi *et al.*, 2018).

According to Schiemann-Delgado, Yang, Loge, Stalvey, Jones, LeGoff, & Mintz (2012) epilepsy ranks among the four neurological disorders. The point-prevalence of epilepsy is almost seven people in a thousand with an annual incidence of 68 persons per 100, 000. The cost of epilepsy is 5221 Euros in Europe as compared to 19749 dollars in the USA. The article recognizes the effectiveness and efficiency of the drug as it is easily absorbed and does not affect the absorption of food as it is administered orally. Levetiracetam rare adverse effects according to Yi, Wen, Cai, Xu, Zhong, Zhan, and Zhai (2018) include reduced sperm quality and elevated kinase as well as general nausea, irritability, and aggressiveness. Apart from these effects, Levetiracetam is not associated with other effects such as memory loss and therefore disqualifies the hypothesis.

When it comes to managing and diagnosing seizures in brain tumour, Fonkem, Bricker, Mungall, Aceves, Ebwe, Tang, & Kirmani (2013) posit that Levetiracetam tends to effectively manage seizure both as an adjunct therapy and a monotherapy. About 50 percent of reduction in seizures has been recorded by a plethora of empirical studies and pieces of evidence. Additionally, the drug shows a proportional bioavailability of 100% after both oral and circulatory management. Levetiracetam, certain intravenously, is regarded as bioequivalent to verbalized medications and is well endured (Fonkem, Ekokobe *et al.*, 2013). Consequently, Lopez-Gongora (2008) argue that both short and long-term use of Levetiracetam does not have any negative impact on the cognitive function. However, it tends to improve cognition and general life.

In addition, Cramer, J. A. et al. (2000), the treatment of seizures related to epilepsy using Levetiracetam is associated with an optimistic impact on the health-related eminence of life. Furthermore, the study to examine the unmet need of epilepsy, findings demonstrate that Levetiracetam together with eslicarbazepine tends to improve cognition (Schmitz, B. et al., 2010). However, other antiepileptic drugs such as vigabatrin may have the possibility of developing psychosis.

On the contrary to the positive effect of Levetiracetam, other studies have demonstrated that Levetiracetam might not be that much useful. According to Weijenberg, Brouwer, & Callenbach (2015), the efficacy of Levetiracetam is an essential aspect in the present review in the sense that it provides an explicit knowledge on the how important the drug is when it comes to treatment of epilepsy. As provided in the clinical trials and other controlled studies, Weijenberg et al. (2015) indicated in their case reports that there is a high efficacy of treatment with Levetiracetam. However, there is publication bias, which has created an unresolved and unrealistic positive view of Levetiracetam efficacy. This is because, in their report, Weijenberg et al. (2015) showed that the fraction of the children was flattering seizure-free in both clinical trials and controlled tests were 61-100 percent. Only 20-46 percent indicated seizure-free in the three forthcoming types of research. Although, the current tolerability and knowledge suggest that Levetiracetam is quite useful when it comes to the treatment of epilepsy, it significant to mention that Levetiracetam does not have any side effect like memory loss in the epileptic cases associated to any other antiepileptic drugs. However, the level of the indication is incomplete and not obtainable for all seizure categories and epilepsy situations (Weijenberg et al., 2015).

There are other side effects of Levetiracetam when it comes to the treatment of epilepsy. They include somnolence, fatigue, and dizziness (Incecik, Herguner, & Altunbasak, 2012). Just as many pieces of literature and studies have identified the positive effect of Levetiracetam in the treatment of epilepsy, not all results and findings are consistent. Plethoras of studies and scientific publications have established the security of Levetiracetam in the diagnosis of children with epilepsy. The occurrence of adverse effects of Levetiracetam is roughly 30 percent to 45 percent and surpassed 50 percent in the study by Incecik et al. (2012).

Furthermore, somnolence, fatigue, and anorexia appeared to be the primary adverse events that mainly obtainable during the titration period and progressively disappeared within the first month.

Additionally, Incecik et al. (2012) provide that Levetiracetam was tremendously well endured, with forty patients (39.2%) restating opposing events. The greatest shared hostile actions were drowsiness, fatigue, and dizziness, the several remaining events are interactive and did not necessitate termination of Levetiracetam. Therefore, it is important to mention that Levetiracetam treatment is effective, harmless, and well stood in children with headstrong epilepsy.

CONCLUSION

In summation, epilepsy is ranked among the fourth neurological disorders that are expensive all over the world to manage. As a result, there are few options of drugs that can effectively manage the disease. Levetiracetam is reportedly one of the best medications for controlling the disorder although it is accompanied by short-term effects and other adverse effects as mentioned earlier. Among all these effects noted by different scholars, there is no single substantial evidence linking Levetiracetam to having effects of memory loss of people or lab animals whatsoever. Therefore, this demystifies the hypothesis of Levetiracetam causing memory loss on epilepsy patients.

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