INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Research Article

A Comparative Study on Efficacy of Levetiracetam and Phenytoin in Pediatric Seizures

P. Saisoumya, P. GnanaJyothi, N. Aradyaashmika, Dr. Arifa Begum S. K., Dr. Swathi Boddupally*, Ch. Asha

Department of Quality Assurance, Shri Sarvajanik Pharmacy College, Mehsana, Gujarat, India

ARTICLE INFO

Published: 22 Apr. 2025
Keywords:
Seizures, Levetiracetam, Phenytoin, neurological disorders
DOI:
10.5281/zenodo.15258390

ABSTRACT

Epileptic seizures are among the most prevalent neurological disorders, characterized by recurrent, involuntary episodes caused by abnormal neuronal electrical activity. With an estimated 1% incidence and 2% prevalence, epilepsy remains a major concern, particularly in pediatric populations. This study aimed to evaluate the comparative effectiveness of phenytoin and levetiracetam in treating seizures among children presenting with various types of epilepsy.From April 2023 to March 2024, a comparative study was conducted in the Department of Paediatrics at Durgabai Deshmukh Hospital and Research Center, Vidyanagar, Hyderabad, Telangana. Seventy-five pediatric patients, irrespective of gender, with a clinical diagnosis of epilepsy, were included. Detailed medical histories, demographic data, and relevant clinical parameters were collected and analyzed to assess the outcomes of treatment with either phenytoin or levetiracetam.The findings of the study revealed that phenytoin demonstrated superior effectiveness in controlling seizures compared to levetiracetam across multiple clinical parameters. This suggests that phenytoin may provide more favorable outcomes in pediatric epilepsy management than levetiracetam when used under monitored clinical conditions.Based on the observed results, the study concludes that phenytoin has a more notable impact on seizure control in children compared to levetiracetam. Further research with larger sample sizes and extended follow-up periods is recommended to validate these findings and optimize treatment protocols in pediatric epilepsy.

INTRODUCTION

Epilepsy denotes a recurrent pattern of seizures, either with or without convulsions. Seizures are caused by an excessive discharge of cortical neurons (EEG).[1] An epileptic patient will experience recurring seizures that start suddenly and end spontaneously[2]. Epilepsy is typically reported to have a 1% incidence rate and a 2% prevalence rate.Epilepsy appears to be multifactorial or polygenic in nature from a genetic perspective.[3] The age of the patient and

***Corresponding Author:** Dr. Swathi Boddupally
Address: *Bharat school of Pharmacy, JNTUH, Ranga Reddy, Telangana, India*.
Email ✉: swathisniz92@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

the type of seizure determine the epilepsy's aetiology. The most frequent causes of hypoxia or birth asphyxia, cerebral injury during delivery, metabolic issues, congenital brain deformities, or infection in early infants[4]. Seizures in this age group, especially in kids between 6 months and 5 years old, can happen in conjunction with a febrile illness.Seizures are referred to as "generalized"[5] if they initially entail synchronous activation of both hemispheres of the brain. Loss of consciousness , muscle contractions are chief symptoms. Levetiracetam has the most significant mode of action is binding to the particular synaptic vesicle protein 2A. (SV2A). It inhibits the release of vesicular neurotransmitters by binding to SV2A.Phenytoin minimizes the activity of brain stem regions important for the tonic phase of a tonic-clonic seizure and stops the focal location of a seizure from spreading. Based on study parameters Phenytoin has more notable positive effects than Levetiracetam in pediatric seizures

MATERIALS AND METHODS

AIM:A comparative study on efficacy of levetiracetam and phenytoin in pediatric seizures.

OBJECTIVE:

- To evaluate and compare the seizure control outcomes in pediatric patients treated with phenytoin and levetiracetam.
- To assess the clinical response and therapeutic effectiveness of both drugs in different types of epileptic seizures.
- To analyze the demographic and clinical characteristics of pediatric patients with epilepsy receiving treatment.
- To determine which drug shows superior efficacy in terms of seizure frequency reduction and overall clinical improvement.

MATERIALS AND METHODOLOGY:

The ethical approval of the study will be conducted only after the approval of the hospital committee. The study site of the research will be conducted at the pediatricsDepartmentof, DurgabaiDeshmukh Hospital, in Vidyanagar, Hyderabad. The duration of the study is proposed to be conducted for 1year.The design of the study is a Prospective observational study.The sample size taken is72-80 samplesA review of all the relevant and necessary data will be collected from patient's record, laboratory records, by interviewing the patients and prescription.We have analyze the data using both inferential and descriptive statistics. Student t test (used for significant difference between two means).P value (<0.05 was statistically significant).Chi – square test (used for significant difference between the proportions).

RESULTS AND DISCUSSION:

1. Age:

Age	Medication		Total Number (%)	P value
	Levetiracetam Number (%)	Phenytoin Number (%)		
< 1 year	6 (33.3)	12 (66.7)	18	0.215
1-5 years	25 (52.1)	23 (47.9)	48	
>5 years	6 (66.7)	3 (33.3)	9	
Total	37 (49.3)	38 (50.7)	75	

Indicates that there was no discernible variation in medication usage by age group. In the Levetiracetam group, 49.3% were on the medication, whereas in the Phenytoin group, 50.7% were on the medication. Therefore, it is

difficult to conclude which medication is more effective based on age distribution.

2. Gender:

Gender	Medication		Total Number (%)	P value
	Levetiracetam Number (%)	Phenytoin Number (%)		
Male	20 (47.6)	22 (52.4)	42	0.738
Female	17 (51.5)	16 (48.5)	33	
Total	37 (49.3)	38 (50.7)	75	

Demonstrates that there was no statistically significant difference in the sex distributions of medication usage. Just 49.3 percent of those assigned to the Levetiracetam group and 50.7 percent of those assigned to the Phenytoin group actually took their prescribed medicine. Therefore, it is difficult to conclude which medication is more effective based on gender distribution.

3. Adverse effects:

Adverse effects	Medication		Total Number (%)	P value
	Levetiracetam Number (%)	Phenytoin Number (%)		
Yes	21 (42)	29 (58)	50	0.072
No	16 (64)	9 (36)	25	
Total	37 (49.3)	38 (50.7)	75	

Shows that there was no significant difference in the occurrence of side effects between the two medications. In the Levetiracetam group, 42% reported side effects, whereas in the Phenytoin group, 58% reported side effects. However, the difference was not significant, with a P value of 0.072.

4. Vitals:

Vitals	**Levetiracetam** Mean (SD)	**Phenytoin** Mean (SD)	P value
Age (years)	3.01 (2.81)	2.94 (3.27)	0.914
Weight (Kg)	11.23 (4.80)	11.57 (6.31)	0.796
SBP	110.97 (6.54)	111.97 (6.51)	0.386
DBP	73.61 (6.53)	75.43 (6.32)	0.230
Pulse rate	98.75 (24.55)	107.26 (26.22)	0.154
Respiratory rate	26.86 (8.85)	27.97 (11.20)	0.656

Demonstrates that the two groups had similar baseline characteristics, suggesting that there was no intervention that may have altered the results. There was no discernible difference in the two groups; mean ages, weights, blood pressures, heart rates, or respiration rates. As a result, it is difficult to determine whether drug is superior based on initial conditions alone.

5. Temperature:

Temperature	Medication		Total Number (%)	P value
	Levetiracetam Number (%)	Phenytoin Number (%)		
Afebrile	23 (44.2)	29 (55.8)	52	0.184
Febrile	14 (60.9)	9 (39.1)	23	
Total	37 (49.3)	38 (50.7)	75	

Demonstrates that neither group had significantly more cases of fever than the other. There was a higher incidence of fever in the Phenytoin group (39.1%) compared to the Levetiracetam group (60.9%). The P value for the difference was 0.184, which means that it was not statistically significant.

6. Lab investigations:

Variable	Levetiracetam		P value	Phenytoin		P value
	Before Mean (SD)	After Mean (SD)		Before Mean (SD)	After Mean (SD)	
Hb	11.26 (1.33)	11.77 (1.21)	0.001	11.13 (1.56)	11.66 (1.28)	0.006
RBC count	4.35 (0.54)	4.55 (0.37)	<0.001	4.42 (0.51)	4.64 (0.33)	0.001
WBC count	37635.1(12264.67)	38151.35 (122515.56)	0.005	16344.74 (23361.05)	60210.58 (161816.24)	0.073
Platelet count	2.94 (0.93)	3.09 (0.87)	0.010	2.99 (0.94)	3.14 (0.64)	0.106
Sodium	131.11 (4.89)	137.73 (2.11)	<0.001	129.74 (5.00)	137.26 (3.30)	<0.001
Calcium	4.73 (1.51)	5.00 (0.76)	0.216	4.67 (1.66)	5.15 (0.93)	0.022
Potassium	3.31 (0.54)	3.39 (0.42)	0.124	3.31 (0.47)	3.39 (0.37)	0.043
Chloride	101.52 (4.98)	101.07 (3.51)	0.389	103.24 (6.17)	102.00 (3.86)	0.066
Total bilirubin	1.08 (0.22)	1.08 (0.19)	0.904	1.36 (1.37)	1.33 (1.36)	0.586
Albumin	4.29 (0.74)	4.42 (0.67)	0.051	4.10 (0.65)	4.38 (0.54)	0.002
Globulin	2.73 (0.48)	2.83 (0.44)	0.060	2.71 (0.61)	2.88 (0.51)	0.002
Alkaline phosphatase	185.51 (133.48)	170.39 (115.65)	0.162	205.68 (144.90)	184.42 (124.64)	0.038
C-reactive protein	6.88 (2.98)	7.47 (3.09)	0.114	7.79 (6.10)	7.85 (2.88)	0.946
GRBS	86.53 (27.61)	83.95 (13.53)	0.494	79.99 (22.07)	83.25 (15.28)	0.267

Shows that there were significant differences in the laboratory parameters before and after the use of the medications. In the Levetiracetam group, the hemoglobin level, RBC count, platelet count, sodium level, and potassium level were significantly different before and after the medication use. In the Phenytoin group, the hemoglobin level, RBC count, WBC count, platelet count, sodium level, potassium level, and chloride level were significantly different before and after medication use. Therefore, both medications had a significant effect on laboratory parameters.

CONCLUSION:

Our research indicates that in the children with seizures, the drug phenytoin rather than the drug levetiracetam has more notable effects on a number of parameters based on our findings.

CONFLICT OF INTEREST:

The authors have no conflicts of interest regarding this investigation.

ACKNOWLEDGMENT

We sincerely thank the pediatrics Department and our respected guides for their support, which made this study successful. The knowledge gained will be valuable for our future endeavors.

HOW TO CITE: P. Saisoumya, P. GnanaJyothi, N. Aradyaashmika, Dr. Arifa Begum S. K., Dr. Swathi Boddupally*, Ch. Asha, A Comparative Study on Efficacy of Levetiracetam and Phenytoin in Pediatric Seizures, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 4, 2450-2454. https://doi.org/10.5281/zenodo.15258390

REFERENCES

1. Wells BG, DiPiro JT, Schwinghammer TL, DiPiro CV, editors. Pharmacotherapy Handbook. 7th ed. New York: McGraw-Hill Medical; p.4.
2. Dhillon S, Sander JW. Epilepsy. In: Walker R, Whittlesea C, editors. Clinical Pharmacy and Therapeutics. 4th ed. Edinburgh: Churchill Livingstone; p.447.
3. Herfindal ET, Gourley DR, Hart LL, editors. Clinical Pharmacy and Therapeutics. 4th ed. Baltimore: Williams & Wilkins; p.571–572.
4. Dhillon S, Sander JW. Epilepsy – Etiology. In: Walker R, Whittlesea C, editors. Clinical Pharmacy and Therapeutics. 4th ed. Edinburgh: Churchill Livingstone; p.448.
5. Herfindal ET, Gourley DR, Hart LL, editors. Clinical Pharmacy and Therapeutics. 4th ed. Baltimore: Williams & Wilkins; p.570.
6. Kumar A, Maini K, Kadian R. Levetiracetam. [Updated 2022 Jun 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan–. Available from: https://www.ncbi.nlm.nih.gov/books/NBK499890/
7. Investopedia. Z-Test Definition [Internet]. Available from: https://www.investopedia.com/terms/z/z-test.asp
8. Rao KV. Biostatistics: A Manual of Statistical Methods for Use in Health, Nutrition and Anthropology. New Delhi: Jaypee Brothers Medical Publishers; Year Not Specified.
9. Rao KV. Biostatistics in Brief Made Easy. New Delhi: Jaypee Brothers Medical Publishers; Year Not Specified.